REMARKS

Initial remarks:

Applicant initially notes with appreciation the Examiner's indication in the July 9 Office Action that Claim 23 is allowed and that Claim 9 would be allowable if appropriately rewritten. In this regard, new Claim 26 includes limitations from dependent Claim 9 rewritten in independent form and is therefore believed to be in condition for allowance and such disposition is respectfully requested.

Drawing Objections:

In the January 16 Office Action, the Examiner has objected to the drawings. Submitted herewith are proposed replacement informal Figures 1 through 5 which should address the Examiner's objections.

Claim rejections under 35 U.S.C. 103(a):

In the January 16 Office Action, the Examiner rejected Claims 1-8, 10-22 and 24-25 under 35 U.S.C. § 103(a) contending that such claims were obvious based on U.S. Patent No. 5,754,714 to Suzuki et al. in view of U.S. Patent No. 6,091,864 to Hofmeister. Applicant respectfully disagrees that the limitations of independent Claims 1, 8, 14, 21 and 24 as currently presented are obvious based on Suzuki in combination with Hofmeister, and respectfully submits that independent Claims 1, 8, 14, 21, and 24, and all claims depending directly or indirectly therefrom are in condition for allowance.

As summarized more fully below, in each of the independent claims, an input light beam is combined with an optical feedback signal and the combined optical signal is modulated in response to an electrical signal to generate a high modulation depth optical signal and the optical feedback signal. More particularly, independent Claim 1 is directed to a high efficiency optical feedback modulator operable to produce a high modulation depth optical signal comprising an optical modulator having a first and a second optical input and a first and a second optical output and an optical feedback system coupling the second optical output to the second optical input and operable to communicate an optical feedback signal from the second optical output to the second

optical input. The first optical input is operable to receive an input light beam and the optical modulator operates to modulate the input light beam and the optical feedback signal in response to an electrical signal to output the high modulation depth optical signal from the first optical output.

Independent Claim 8 is directed to a high efficiency optical feedback modulator comprising an optical modulator having at least two optical inputs and at least two optical outputs, with an input light beam being receivable on at least one of the optical inputs, and an optical feedback system configured to feed an optical feedback signal from at least one of the optical outputs to at least one of the optical inputs. The optical modulator includes a first optical coupler wherein the input light beam is combined with the optical feedback signal to produce first and second optical signals, is operable to modulate the first and second optical signals in response to an electrical signal to produce first and second phase shifted optical signals, and includes a second optical coupler wherein the first phase shifted optical signal is combined with the second phased shifted optical signal to produce the optical feedback signal and a high modulation depth optical signal.

Independent Claim 14 is directed to a fiber optic system comprising a high efficiency optical feedback modulator operable to receive an electronic input signal, an optic fiber coupled to an optical output of the optical modulator and operable to communicate a high modulation depth optical signal, and an optical receiver operable to receive the high modulation depth optical signal and convert the high modulation depth optical signal into an electronic output signal. The high efficiency optical feedback modulator includes an optical modulator having at least two optical inputs and at least two optical outputs and an optical feedback system feeding an optical feedback signal from at least one of the optical outputs to at least one of the optical inputs. The optical modulator is operable to receive an input light beam on at least one of the optical inputs, combine the optical feedback signal with the input light beam, and modulate the combined input light beam and optical feedback signal in response to the electronic input signal to produce the high modulation depth optical signal.

Independent Claim 21 is directed to a method for producing a high modulation depth optical signal comprising the steps of communicating an input light beam to a first optical input of an optical modulator, communicating an optical feedback signal from a second optical output of the optical modulator to a second optical input of the optical modulator, coupling the input

light beam with the optical feedback signal to produce a first and a second optical signal, intensity modulating at least one of the optical signals with an electronic input signal to produce a first and a second phase shift optical signal, and coupling the phase shift optical signals to produce the high modulation depth optical signal and the optical feedback signal.

Independent Claim 24 is directed to a fiber optic system comprising a high efficiency optical feedback modulator operable to receive an electronic input signal and intensity modulate an input light beam with the electronic input signal to produce a high modulation depth optical signal. The high efficiency optical feedback modulator comprises a Mach Zehnder two-by-two optical modulator having at least two optical inputs and at least two optical outputs and an optical feedback system coupling at least one of the optical outputs to at least one of the optical inputs. The fiber optic system also comprises an optic fiber coupled to an optical output of the optical modulator and an optical receiver. The optic fiber is operable to communicate the high modulation depth optical signal and the optical receiver is operable to receive the high modulation depth optical signal and convert the high modulation depth optical signal into an electronic output signal.

The combination of Suzuki and Hofmeister does not render obvious to one skilled in the art the various combinations of limitations required by independent Claims 1, 8, 14, 21 and 24 because together, Suzuki and Hofmeister fail to teach combining an input light beam with an optical feedback signal and modulating the combined optical signal in response to an electrical signal to generate both a high modulation depth optical signal and the optical feedback signal.

In this regard, Figure 7 of Suzuki depicts a Mach-Zehnder interferometer type optical switch that switches a signal light pulse that enters the switch through an input terminal 11 of an input optical coupler 1 between one of two output terminals 13, 14 of an output optical coupler 2 based on the presence or absence of a control light pulse that enters the switch through a first polarization coupler 3 and exits via a second polarization coupler 4. In the absence of the control light pulse, all signal output comes out of the first output terminal 13 of the output optical coupler 2. When a control light pulse is introduced to the first polarization coupler 3 in synchronism with the signal light pulse introduced into the input optical coupler 1, the signal output of the output optical coupler 2 is switched to the second output terminal 14 of the output optical coupler 2. (See Suzuki, Col. 19, lines 1-28 and 49-65). However, the first or the second output terminals 13, 14 are not shown or

described as being coupled back into the input optical coupler 1 or the first polarization coupler 3. Thus, no portion of the signal output from either of the output terminals 13, 14 is fed back into the switch depicted in Fig. 7 of Suzuki. This makes Suzuki's optical switch fundamentally different from Applicant's invention, since in accordance with Applicant's invention, the optical feedback signal is taken from an output of the modulator and fed back into the modulator.

Further, Applicant respectfully disagrees with the Examiner's contention on page 3 of the January 19 Office Action that Suzuki discloses "an optical feedback system coupling the second optical output to the second optical input that is operable to communicate an optical feedback signal from the second optical output to the second optical input (control light)". In this regard, Fig. 7 of Suzuki shows the control light exiting the switch via the second polarization coupler 4 before the control light even reaches the output optical coupler 2 which has the second optical output terminal 14. Also, there is simply no discussion or indication made in the description of Fig. 7 of Suzuki that the control light exiting the second polarization coupler 4 is fed back into the first polarization coupler 3. (See Suzuki Col. 19, lines 1-65). Thus, due to the significant differences noted above, Suzuki simply cannot be combined with Hofmeister achieve Applicant's invention as claimed in each of independent Claims 1, 8, 14, 21 and 24.

In addition lacking disclosure of significant elements as noted above, even if Suzuki did disclose all of the elements that the Examiner contends are disclosed therein, one skilled in the art would not be motivated to combine Suzuki with Hofmeister. Suzuki is directed to addressing an entirely different problem within optical communication networks than Applicant's invention. More particularly, Applicant's invention is concerned with modulating an optical signal that may be, for example, subsequently transmitted within an optical network, in a manner that produces greater variation in optical intensity (i.e. high modulation depth) than with conventional optical modulators. High modulation depth is desirable because it improves the dynamic range and signal-to-noise ratio of the modulated optical signal thereby reducing negative affects of signal distortion within an optical fiber through which the modulated optical signal is transmitted and increasing subsequent detectability of the original electrical signal in accordance with which that optical signal is modulated. Suzuki is instead concerned with switching an input optical signal, which may or may not have previously been modulated, on different output paths within an optical network. Thus, Applicant's invention and Suzuki are directed to addressing different problems within optical

networks, and one skilled in the art would therefore not be motivated to combine Suzuki with Hofmeister to achieve Applicant's invention.

Based upon the foregoing, pending independent Claims 1, 8, 14, 21, and 24 as well as their corresponding dependent claims are allowable over the combination of Suzuki and Hofmeister. There is therefore no need to separately address the patentability of each dependent claim and/or the Examiner's interpretation in relation to any of the dependent claims or any of the references of record in relation thereto.

Conclusion:

In view of the foregoing, Applicant believes that all pending claims are in condition for allowance and such disposition is respectfully requested. In the event that a telephone conversation would further prosecution, the Examiner is invited to contact the undersigned.

Respectfully submitted,

MARSH FISCHMANN & BREYFOGLE LLP

By: Robert B. Berube

Robert B. Berube, Esq.
Registration No. 39,608
3151 South Vaughn Way, Suite 411
Aurora, Colorado 80014
Telephone: (303) 338-0997
Facsimile: (303) 338-1514

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